DESCRIPTION

CLEANING SYSTEM OF A HAIR REMOVING APPARATUS

TECHNICAL FIELD

The present invention is directed to a cleaning system of a hair removing apparatus, particularly a dry shaver with the use of a cleaning liquid.

BACKGROUND ART

U.S. Patent No. 5,711,328 shows a cleaning system of a dry shaver having a cleaning device. The device is formed at its lower end with a basin for accommodating therein a shaver head of the shaver, and a tank containing a volume of a cleaning liquid and communicating with the basin through a liquid supply channel. A pump is provided to supply the liquid from the tank into the basin for cleaning the shaver head, i.e., cutters and the associated parts. The dry shaver is elongated in shape to have the shaver head at its top end and an electric port at the opposite bottom end. When cleaning the shaver head, the shaver is held on the housing upside down with the shaver head placed into the basin. The housing is provided with an electric terminal to give an electric signal to the dry shaver in order to drive the shaver head while circulating the liquid from the tank to the basin for enhancing the cleaning effect. The electric terminal is made for connection with the electric port at the bottom of the shaver. For this purpose, the housing is provided with a vertical stand carrying the electric terminal at its upper end for connection with the electric port of the shaver held upside down by the housing. Thus, the portion of the vertical stand carrying the electric terminal adds an extra height dimension to the housing, in addition to making itself as a hindrance to the placement of the shaver upside down on the

housing, thereby detracting from the compactness of the whole system as well as the convenience.

DISCLOSURE OF THE INVENTION

The present invention has been achieved in view of the above problems to provide an improved cleaning system composed of a hair removing apparatus and a cleaning device for cleaning an operator head of the apparatus. The apparatus has a height and carries at its top end an operator head. The apparatus incorporates an externally controllable electric circuit for driving the operator head and/or charging the apparatus in accordance with an external electric signal. The cleaning device includes a housing configured to hold the apparatus upside down, a basin formed in the housing for accommodating therein the operator head. A tank is provided on the housing to contain a volume of a cleaning liquid. The cleaning device includes a supplying means for supplying the cleaning fluid from the tank to the basin for cleaning the operator head, and includes a controller for activating the supplying means as well as for providing the electric signal. The housing is formed with a signal transmitting means for transmitting the electric signal, while the hair removing apparatus has a signal receiving means which comes into electrical interconnection with the signal transmitting means for giving the electric signal to the electric circuit when the apparatus is held by the housing. The important feature of the present invention resides in that the signal transmitting means is disposed at a portion of the housing upwardly of the basin, and that the signal receiving means is disposed intermediate the height of the apparatus. Thus, the mechanism or parts for the electrical connection between the signal transmitting

means and the signal receiving means can be located within the height of the apparatus being held by the housing of the device, and therefore add no extra height dimension to the combination of the device and the apparatus, thereby making the whole system compact sufficient to be installed in a limited space.

In a preferred embodiment, the signal receiving means is composed of terminal pads formed on the exterior of an apparatus's casing, and the signal transmitting means is realized by a set of contacts exposed on an exterior of the housing for pressed contact with the terminal pads, respectively.

Alternatively, the signal transmitting means is composed of a primary winding that is concealed within the housing and is electromagnetically coupled to a secondary winding held within the apparatus. The primary winding is electrically coupled to the controller, while the secondary winding is electrically coupled to the electric circuit of the apparatus and defines the signal receiving means. The primary and secondary windings can be therefore concealed respectively within the apparatus's casing and the device's housing to establish contact-free transformer coupling.

Preferably, the housing is provided with holding means which holds the apparatus in a position where the signal transmission means is kept in electrical interconnection with the signal receiving means, insuring the electrical interconnection.

For establishing a reliable electrical interconnection between the device and the apparatus, the holding means is preferred to include a mechanism that gives a bias for urging the signal transmitting means towards the signal receiving means. That is, the mechanism may be in the form of a pulling unit that pulls the apparatus towards the housing, or in the form of a pushing unit that pushes

the apparatus against the housing.

Further, the housing may be shaped to have a bearing surface for bearing the apparatus. The bearing surface is inclined with respect to a height axis of the housing and is provided with a stopper for engagement with a portion of the apparatus such that the apparatus is guided along the inclined bearing surface and develops the bias force by its own weight when it is engaged with the stopper.

These and still other advantageous features of the present invention will become more apparent from the following description of the preferred embodiment when taken in conjunction with the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a cleaning system shaver in accordance with a preferred embodiment of the present invention;

FIG. 2 is a schematic view illustrating the operation of the above system;

FIG. 3 is a rear perspective view of the system in a rather schematic representation;

FIG. 4 is a front view of a dry shaver of the above system;

FIG. 5 is a circuit block diagram of the above device illustrating the operation of the above system;

FIG. 6 is a front perspective view of the above system with the dry shaver being removed therefrom;

FIGS. 7 and 8 are vertical sections of the above system, respectively with and without the shaver;

FIG. 9 is another vertical section of the above system;

FIG. 10 is a rear vertical section of the above system;

FIG. 11 is a front view of the above system;

FIG. 12 is a vertical section of a detachable tank utilized in the above system;

FIG. 13 is a top view of a drip pan utilized in the above system;

FIG. 14 is a vertical section of the drip pan;

FIG. 15 is a vertical section of a cleaning device in accordance with a modification of the above embodiment; and

FIG. 16 is a vertical section of a cleaning device in accordance with a further modification of the above embodiment.

BEST MODE FOR CARRYING OUT THE INVENTION

Referring now to FIGS. 1 and 2, there is shown a cleaning system for cleaning a hair removing apparatus, for example, a dry shaver **10** or epilator with the use of a cleaning liquid. The system includes a cleaning device which has a housing **20** with a base **30** and a stand **40** upstanding from a rear end of the base. Formed at the front end of the base **30** is a basin **50** which is configured to receive an operator head, i.e., a shaver head **12** of the shaver **10**. The cleaning liquid is stored in a tank **100** detachably mounted to the stand **40** and is connected to the basin **50** for supplying the liquid into the basin and for recovering the liquid therefrom. The device includes a pump **70** which is controlled to circulate the cleaning liquid between the tank **100** and the basin **50** for cleaning the shaver head **12**. The cleaning operation continues for a predetermined period. Thereafter, a control is made to collect the liquid from the basin **50** into the tank **100**, details of which will be discussed later. Upon recovery of the liquid into the tank, a fan **200** is actuated to produce a forced air

flow over the head **12** for drying the same.

As shown in FIG. 2, a drip pan **60** is disposed immediately below the basin **50** for collecting the liquid dripping and/or overflowing from the basin **50**. The drip pan **60** has a top opening which communicates with a drain port **52** at the bottom center of the basin **50**, and also with an overflow duct **34** leading to an upper edge of the basin **50**. The drip pan **60** has a filter **63** for entrapping contaminants dislodged from the shaver head **12** and carried on the liquid dribbling through the drain port **52** into the drip pan **60**. The liquid thus cleared of the contaminants is fed through a connection port **65** to a fluid intake channel **22** leading to the tank **100**. The pump **70** is disposed in the fluid intake channel **22** for drawing the liquid from the basin **50**. The fluid intake channel **22** is open to the atmosphere through the drain port **52**, the overflow duct **34**, and also through an air vent **36** formed in the base **30** around the basin **50**. Thus, depending upon the level of the liquid in the basin **50**, the outside air is drawn alone or together with the liquid by the action of the pump **70** into the tank **100** through the fluid intake channel **22**. The tank **100** is provided in the form of a hermetically sealed container having an inlet and an outlet. The inlet is defined by a fluid inlet tube **102** which is detachably connected to the fluid intake channel **22** for taking in the liquid and/or the air. The outlet is defined by a liquid outlet tube **104** which is detachably connected to a liquid supply channel **24** formed in the housing **20** and leading to a spout **25** upwardly of the basin **50**, as best shown in FIG. 9, for flowing the liquid down into the basin **50**. Turning back to FIG. 2, the liquid outlet tube **104** is connected to a U-shaped sucking tube **105** which extends deep into the tank **100** to a point adjacent to the bottom of the tank for sucking the liquid. Further, the tank **100** is formed with an air exhaust tube

106 detachably connected to an air exhaust channel **26** which extends within the housing **20** and is open to the atmosphere through ventilation windows **28** or clearances in the walls of the housing **20**. An air valve **80** is disposed in the air exhaust channel **26** to selectively close the tank and open it to the atmosphere. The air valve **80** is realized by a normally-closed electromagnetic valve which opens upon being energized or supplied with an electric current. A cap **112** is detachably and sealingly mounted in a filling port **110** in the upper end of the tank **100** for replacing or replenishing the liquid.

Now, the operation of the device is discussed with reference to FIGS. 2 and 5. The device includes a power supply **90** providing an electric power to various electrical parts, and a controller **92** responsible for controlled operations of the associated parts. When a switch **94** is activated, the controller **92** responds to provide a supply mode and a recovery mode in sequence. In the supply mode, the pump **70** is activated with the air valve **80** being kept closed, i.e., the tank being kept hermetically sealed. Initially, the basin **50** is substantially free from the liquid such that only the air is drawn and accumulated in the tank **100** to increase the inside air pressure. As the air pressure increases, the liquid in the tank **100** is forced to expel out through the liquid outlet tube **104** and the liquid supply channel **24** into the basin **50**. In this connection, it is noted that the drain port **52** of the basin **50** is dimensioned such that the flow rate of the liquid dripping into the drip pan **60** is smaller than that of the liquid being supplied from the tank **100**, thereby increasing the amount of the liquid in the basin **50**. After the basin **50** is filled with the liquid, an extra amount of the liquid is caused to overflow into the drip pan **60**, maintaining the liquid in the basin **50** at a constant level. In this connection, the air is continuously drawn

into the tank with the superfluous liquid to keep supplying the liquid into the basin **50**, i.e., circulating the liquid between the tank **100** and the basin **50** for cleaning the shaver head **12**. The supply mode continues over a predetermined time period during which the shaver head is activated intermittently or continuously to shake the contaminants off, enhancing the cleaning effect.

The supply mode is automatically followed by the recovery mode in which the pump **70** is activated with the air valve **80** kept opened to collect the liquid from the basin **50** through the drip pan **60** into the tank **100**. With the air valve **80** being opened, i.e., the tank **100** opened to the atmosphere, the air drawn by the pump **70** is exhausted through the air valve **80** so as to recover the liquid and collect only the liquid in the tank **100**. The recovery mode continues over a predetermined time period to collect the whole liquid into the tank. Near the end of the period, the shaver head is controlled to be activated for shaking the liquid off. Thereafter, the fan **200** is activated to dry the shaver head with or without the shaver head being actuated. Thus, the supply mode and the recovery mode are accomplished with the use of a single pump and the air valve.

As schematically shown in FIG.3, the tank **100** is L-shaped to have a wide header section **114** and a vertically elongated section **116** overlapping the rear face of the stand **40**. The tank **100** is mounted on the housing **20** with the horizontal section **114** resting on a mounting face **41** on top of the stand **40**. The fluid inlet tube **102**, the liquid outlet tube **104**, and the air exhaust tube **106** are integrally formed with the tank **100** to project on the bottom of the header section **114** for detachably connection with the fluid intake channel **22**, the liquid supply channel **24**, and the air exhaust channel **26**, respectively. For this purpose, the ends of the channels **22**, **24**, and **26** are integrated into a

combination socket **28** formed in the mounting face **41**, as shown in FIG. 10. Thus, the tank **100** can be attached to the housing **20** from the above.

The device further includes a filter detector **98** which issues a stop signal when the drip pan **60** is not in position below the basin **50**. In response to the stop signal, the controller **92** deactivates the pump **70** and the associated parts to cease the above operation. A display **96** is included in the device to give information about which one of the supply mode and the recovery mode is proceeding, and the elapsed time. Further, a signal transmitting terminal **91** is provided on the side of the housing **20** for transmitting an electric signal that is received in a shaver controller **14** to activate the shaver head **12** or a charging circuit **16** for charging a battery **15**. As best shown in FIGS. 6 and 7, the terminal **91** includes a set of contacts **93** exposed on the front wall of the stand **40** for contact with a corresponding set of pads **13** formed on the exterior of the shaver **10**. The pads define a signal receiving terminal **11** represented in FIG. 5 through which the signal is transmitted to the shaver controller **14**. The contacts **93**, i.e., the terminal **91** is located intermediate the height of the stand **40** for intimate contact with the pads **13** or the receiving terminal **11** when the shaver **10** is held upside down to place the shaver head **12** into the basin **50**.

Alternatively, as shown in FIG. 15, the housing **20** may include the signal transmitting terminal in the form of a primary winding **93A** for transformer coupling with a secondary winding **13A** placed within the shaver as the signal receiving terminal. In this modification, both of the windings can be concealed within the housing and shaver, respectively.

As shown in FIG. 6, the stand **40** carries a holding means, i.e., a mechanism of holding the shaver **10** in position. The mechanism includes a pair

of clasps **42** which are spaced widthwise with respect to the height dimension of the housing **20** and are pivotally supported to the stand **40** to be movable between a holding position of bracing the shaver **10** and a releasing position permitting the removable of the shaver. The clasps **42** are biased by coil springs **43** to the holding position in which the clasps **42** engage the opposite sides of the shaver **10**. Each of the clasps **42** is formed at its upper and lower end respectively with inclined guides **44** for sliding contact with tapered head sides **18** as well as top tapered sides **19** adjacent to the shaver head **12**, as shown in FIG. 4. Thus, the clasps **42** can be forced to open temporarily in the release position when the shaver is moved vertically to place the shaver head **12** into the basin **50**, allowing the easy attachment of the shaver, after which the clasps close by the action of the springs into the holding position. Also, when the shaver is moved vertically to pull the shaver head **12** out of the basin **50**, the clasps **42** are forced to open by contact with the top tapered sides **19** of the shaver, permitting the easy detachment of the shaver from the device. In the holding position, the clasps **42** urges the shaver **10** towards the stand **40** in order to keep the pads **13** of the receiving terminal **11** pressed against the corresponding contacts **93** for reliable signal transmission therebetween. In this embodiment, the clasps **42** establishes a pulling unit that pulls the apparatus **10** towards the stand **40**, i.e., a portion of the housing **20** opposed to the apparatus under the bias of the springs **43** for reliable electrical interconnection between the apparatus **10** and the device.

As shown in FIGS. 7 to 9, the stand **40** has a front face which is configured to guide the apparatus **10** to a holding position where the shaver head **12** is received within the basin **50**. For this purpose, the front face has is a

guide face **46** which is inclined with respect to a vertical or height axis of the housing **20** and which is formed at its lower end with a stopper **48** for abutting against a shoulder of the apparatus or shaver **10**. The stopper **48** is positioned so that the apparatus **10** is caused to lean upon the front face of the stand by its own weight, thereby urging the pads **13** of the receiving terminal **11** against the contacts **93** of the transmitting terminal **91** for reliable electrical contact therebetween. In this sense, the electrical connection can be made successfully even without relying upon the springs **43** of the clasps **42**.

FIG. 16 shows a modification of the above system in which the housing **20** carries a holding means **40B** in the form of a pushing unit that includes a pusher **42B** movably supported by the housing **20**. The pusher **42B** is normally biased by a spring **43B** to have its end abutted against the shaver **10**, thereby holding the shaver in position and at the same time developing a contact pressure between the signal transmitting terminal **91B** of the housing **20** and the signal receiving terminal **11B** of the shaver for reliable electrical interconnection therebetween. In this modification, like parts are designated by like reference numerals with a suffix letter of "B".

The drip pan **60** is made detachable to the housing **20** for easy cleaning of the filter **63** as well as the pan **60** itself. As shown in FIGS. 7, 8, and 14, the drip pan **60** is provided in the form of a drawer having a front handle **64** and the top opening which comes into fluid communication with the drain port **52** of the basin **50**, the air vent **36**, and the overflow duct **34** for receiving the liquid and/or the air therethrough. A recess **32** is formed at the front end of the base **30** immediately below the basin **50** to accommodate the drip pan **60**. The inner bottom of the pan **60** is inclined downwardly towards the connection port **65** for

smoothly guiding the liquid to the fluid intake channel **22**. As shown in FIG. 14, the interior space of the drip pan **60** is divided by the filter **63** into a first chamber **61** and a second chamber **62**. The first chamber **61** is in direct open communication with the drain port **52** and the overflow duct **34** for collecting the liquid and/or the air respectively therethrough, thereby depositing the contaminants carried by the liquid on the filter **63**. The second chamber **62** is in direct open communication with the air vent **36** and with the connection port **65** for feeding the liquid cleared of the contaminants as well as the outside air into the fluid intake channel **22**. For this purpose, the filter **63** is bent into an L-shaped section, as shown in FIG. 14. The pan **60** is formed with an electrode (not shown) which is sensed by the filter detector to determined the presence of the pan in the recess **32**. The drip pan **60** is designed to have a liquid storing capacity larger than that of the basin **50** in order to collect the entire volume of the liquid from the basin **50** even if the pump **70** should stop during the supply mode. The filter is preferred to have a filtering area of 700 mm^2 or more. Further, instead of providing the removable drip pan **60**, the filter **63** alone may be detachable to the housing for frequent cleaning purpose.

The cleaning system in accordance with the present invention can be equally applied for cleaning the epilating head of a hand-held epilator or other operator head of similar hair removing apparatus.